DELIBERATIVE

EPA Region 3 and DNREC SHWMS – Bloom Energy Regulatory Analysis

On February 5, 2016, EPA Region 3 Land and Chemicals Division staff met with Delaware Department of Natural Resources and Environmental Control (DNREC) Solid and Hazardous Waste Management Section (SHWMS) staff to perform a thorough regulatory analysis of Bloom Energy's desulfurization filter waste. The following is a discussion of the findings of that meeting. All attendees have reviewed this report and are in agreement on the analysis.

Conditionally Exempt Small Quantity Generator (CESQG) Status

- A conditionally exempt small quantity generator (CESQG) is not subject to the notification (registration) or other generator requirements under the Resource Conservation and Recovery Act (RCRA) if certain conditions are met. Please see attached flowchart for specific conditions.

- Bloom has provided numbers that indicate that the largest facility in Delaware generated at least 21,000 pounds (lbs) of spent filter material in 2015. Approximately half of this material was counted as hazardous waste: about 3300 lbs in January and about 5800 lbs in April. By these numbers, Bloom does not meet the threshold for a CESQG, which is 220 lbs/month.

- Even if Bloom were to qualify as a CESQG, Bloom would still have to ensure that all waste is sent to appropriate treatment (including reclamation), storage, or disposal facilities (TSDFs). Bloom's current practice is to ship waste to a large quantity generator, rather than a permitted TSDF, which does not constitute appropriate waste management.

2015 Definition of Solid Waste (DSW) Recycling Exclusions

- Hazardous material that is legitimately reclaimed according to specific conditions under the new Definition of Solid Waste (DSW) are excluded from the definition of solid waste and thus from hazardous waste requirements. Please see attached flowchart for specific conditions. Please note this is a federal rule and Delaware has not yet decided to adopt the rule in full.

- Spent filter material from Bloom facilities is not being legitimately reclaimed. Bloom has stated and confirmed that recyclable material (copper carbonate) has recently been shipped to a fertilizer company via brokers. Hazardous waste that is recycled by being incorporated into a product that is applied to land, such as fertilizer, is considered to be used in a manner constituting disposal (not reclaimed). Under RCRA, this is a spent material, considered both a solid and hazardous waste, and must be sent to a permitted TSDF if reclamation is to occur.

- Even if the material were legitimately reclaimed, a main condition of the DSW exclusions is that material being shipped off-site must go to a facility under the control of the generator or to a "verified recycler" designated by the generator. Initially, Bloom claimed that reclamation was occurring at Unicat, which may have been under the control of the generator. However, recent information from Bloom clarifies that Bloom now relies on a brokered relationship between VLS and potentially numerous facilities. The exclusions rely on a clearly delineated relationship and arrangement between generators and reclaimers, which, by Bloom's admission, is not the case.

- Finally, the proportion of material that is eligible for reclamation is small compared to the total quantity of waste Bloom generates. Bloom used two different types of filter material and only one (the Unicat filters) contains the recyclable material, copper carbonate. We estimate that only about 10-15% of all Bloom material is recyclable. Furthermore, Bloom has stated that it is no longer using the Unicat filters, so this small proportion is expected to become even smaller.

Generator of Non-hazardous Waste

- Solid waste that is not hazardous is not subject to the hazardous waste requirements. Please see attached flowchart for the scenarios under which a solid waste is non-hazardous.

- Bloom has admitted that spent filter material exceeds regulatory limits for benzene, making the filter waste characteristically hazardous. Requests for additional information and analytical data have not been fulfilled. Based on the limited information that has been provided by Bloom, including SDSs for unused filter material, the filter material may have other hazardous characteristics or toxic constituents. To date, Bloom has neither claimed nor demonstrated (through representative analytical results or detailed process knowledge) that filter waste is non-hazardous.

Manufacturing Process Unit (MPU) Exemption

- Hazardous wastes generated in manufacturing process units (MPUs) under specific circumstances are exempt from notification, generator, transport, or disposal requirements. Please see the attached flowchart for the specific circumstances.

- Bloom's desulfurization units (Desulf Units) are not covered under the MPU exemption because Desulf Units are not tanks or tank-like units and are not designed for manufacturing. Desulf Units meet the regulatory definition of a container, being portable even though they are stationary during operation. Moreover, Desulf Units are primarily operated to clean natural gas. Per EPA guidance, cleaning is not a manufacturing process.

- Even if the Desulf Units are MPUs, the exemption does not apply to units (which were stationary during operation) once they are shipped off-site for cleaning. Bloom claims that the structural integrity of the Desulf Units nullifies this interpretation, however, the MPU exemption is not conditioned on structural integrity, nor does structural integrity appease other concerns about incomplete cradle-to-grave oversight and improper management.

- Even if the Desulf Units were deemed to have structural integrity for off-site shipping, EPA guidance is clear that if equipment, at any time, carries only hazardous waste, it is not considered part of the process unit. Prior to removing the Desulf Units from the Energy Servers, Bloom purges units of natural gas, such that only waste remains in the units when the units are removed. This point, when the Desulf Units exit the Energy Server, is the point at which waste exits the manufacturing process and, therefore, the point at which the waste is subject to regulation.

- Even if the MPU exemption does apply to the Desulf Units, the material is still considered hazardous waste and Bloom still has obligations as a generator. The preamble to the MPU exemption rule states that all owners, operators, and waste removers are considered to be acting as generators and are therefore jointly and severally liable under RCRA.

Hazardous Waste Generator Requirements

- As a generator of hazardous waste, Bloom is subject to the following federal and state RCRA requirements, including, but not limited to:

  - The owner/operator (Bloom) must make a hazardous waste determination.
  - Bloom locations need a generator identification number (EPA ID number).
  - Waste needs to be shipped under manifest, with one-time land disposal restriction notices, to a permitted designated TSDF and records must be maintained.
  - Waste must be transported by an authorized transporter with an EPA ID number.
  - Facilities which are large quantity generators (LQGs) must file biennial or annual reports.
  - Facilities which are LQGs need contingency plans, annual employee training, and to maintain associated records.
  - To the extent that waste is stored onsite, waste must be in containers that are labeled, dated, closed, inspected weekly, and not stored greater than 90 days (LQGs) or 180 days (small quantity generators).

- EPA and DNREC are in agreement that the waste is a spent material and is therefore a solid waste. Based on Bloom's representations, the waste is also hazardous for (at least) benzene.

- All Bloom facilities that we are aware of in Delaware have EPA ID numbers. The Delmarva Red Lion facility registered as a large quantity generator and developed a contingency plan, conducted training, and began weekly inspections pursuant to the LQG requirements.

- For shipments from Delaware facilities, Bloom has used the same transporter, regardless of whether the waste is being shipped as hazardous or non-hazardous. Costs associated with using different categories of waste transporters are therefore minimal. Other costs may include fees based on where the waste is going (a municipal solid waste landfill is less expensive than a permitted hazardous waste disposal facility (TSDF), but Bloom's waste is ultimately sent via VLS to a TSDF already. Finally, there may be costs associated with shipping units individually as opposed to consolidating material at a central facility. However, based on Bloom's own admissions, Bloom is already covering the majority of costs associated with hazardous waste management.

- It is also important to note that EPA and DNREC have identified at least two other fuel cell manufacturers who state their desulfurization waste is considered hazardous waste and is managed in accordance with all RCRA requirements.

The February 5, 2016, meeting was successful in confirming and formalizing consensus between EPA Region 3 and DNREC SHWMS. The findings of the meeting, reported here, reflect our collective understanding of Bloom's operations and our joint interpretation of the RCRA regulations as applicable to Bloom's filter waste. EPA and DNREC agree that desulfurization canisters are not MPUs and that the small proportion of filter waste that contains recyclable materials is used in a manner constituting disposal, not reclaimed. Until such time as Bloom demonstrates that spent filter waste is not characteristically hazardous (for any of the hazardous waste characteristics), EPA and DNREC agree that Bloom is considered a generator of hazardous waste, subject to RCRA requirements. We look forward to continued collaboration as we work to ensure that Bloom is in compliance with the hazardous waste regulations and that the waste is properly managed to protect human health and the environment.